User's Manual

RL78/G1E Stick Starter Kit

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- This product should be handled like a CMOS semiconductor device. The user must take all precautions to avoid build-up of static electricity while working with this equipment.
- All test and measurement tool including the workbench must be grounded.
- The user/operator must be grounded using the wrist strap.
- The device pins should not be touched with bare hands.

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1. Overview

1.1 Document Overview

This document describes the hardware specifications, software structure, and USB driver installation for RL78/G1E Stick board. It describes an example of “Smart Analog” circuit design using mounted phototransistor at the end.

1.2 Terms in This Document

This document uses following teams for explaining the hardware specifications and software.

Table 1.1 List of Terms

Term	Description
Smart Analog	Product that analog circuits and features are reconfigurable by software designed for supporting multiple sensors and drivers.
Smart Analog MCU	Product that is categorized in above term, but it is a package of microcontroller and analog circuit.
Body case	Plastic case with board built-in
GUI “Smart Analog Easy Starter”	Development tool for RL78/G1E Stick
E1 Emulator	On-chip debugging emulator from Renesas Electronics. This can be used as a flash programmer. (selling separately)
CubeSuite+	Integrated development environment packaging all basic software tools for developing software on microcontrollers form Renesas Electronics.
SA-Designer	Development tool from Renesas Electronics. It generates circuit data as C source code from the analog frontend circuit designs of Smart Analog product.

1.3 Board Features

- USB stick board shape with Smart Analog MCU, phototransistor, and extended terminals mounted.
- Enable to get illuminance of phototransistor with using the GUI “Smart Analog Easy Starter”.
- Extensibility to add sensors. (*Use through-hole, the extension terminal, on board)

1.4 Product Overview

The product contains following items.

- RL78/G1E Stick (board is inside the body case)
- Documentations
  This contains some specific notes and downloading URLs for the GUI “Smart Analog Easy Starter” and USB driver. Please read this before start using.

*The product does not bundle USB cable (Mini-B type). Please prepare it by yourself.

The product is packaged as shown below.

Figure 1.1 Product Package

The product usage sample is shown below. It can design the analog part of RL78/G1E microcontroller by using the GUI “Smart Analog Easy Starter”.

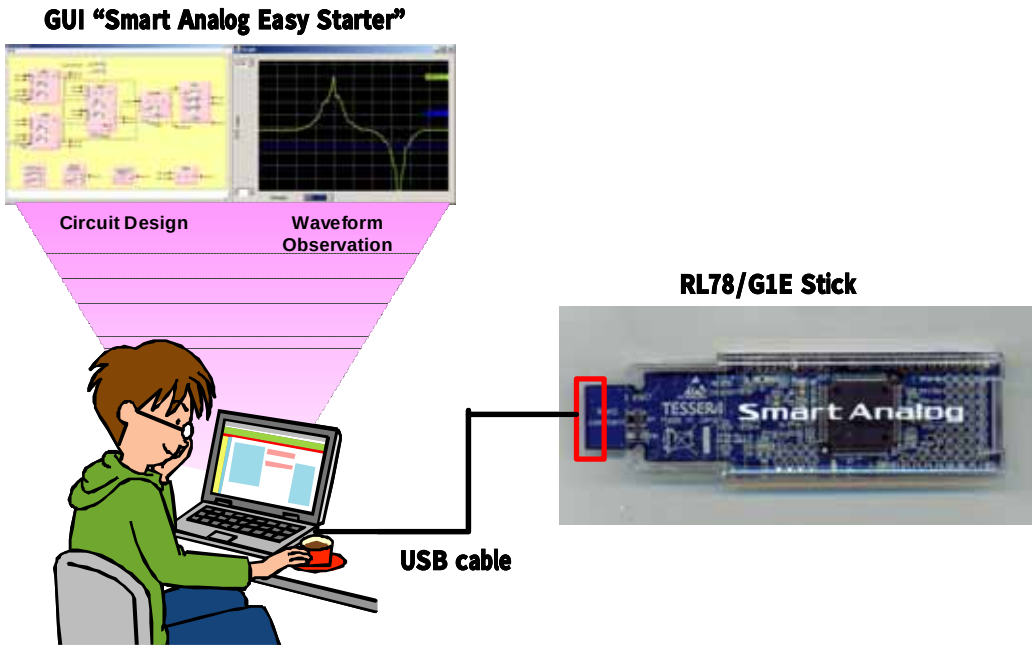


Figure 1.2 Product Usage Sample Image

2. Hardware

This section describes the hardware specifications of the product. For circuit diagrams and parts list, please refer to “4 Hardware Materials”.

2.1 Hardware Specifications

The specifications of the product are described in below table.

Table 2.1 Hardware Specifications

Specification	
CPU	RL78/G1E R5F10FMEAFB from Renesas Electronics (Flash ROM: 64KB, RAM: 4KB, Data Flash: 4KB)
Operation Frequency	Main system clock: High-speed on-chip oscillator 32MHz Low-speed on-chip oscillator 15kHz
Interface	USB connector (Mini-B) Following terminals are available at the through-holes on board: - External power connection terminal - E1 Emulator connection terminal - Sensor connection terminal
Supply Voltage	+5.0V (USB power supply) *
Operation Check Hardware	LED Phototransistor (SFH3710-3/4-Z from OSRAM)
Product Size	Body case size: 76 x 23 x 12 mm (W x D x H) Board size: 74 x 19.6 mm (W x D)

* It can supply power through the external power connection terminal as extended function. Do not supply power from the external power connection terminal when it is connected to PC with USB cable. It receives power from PC as well and it may cause the board breakdown.

The product allows developers to connect external power supply, E1 Emulator, and sensors other than phototransistor by taking the board out of the case and using extended terminals on the board. For the connection of external power supply, E1 Emulator and sensors, please refer to “3 Extended Functions”.

3. Extended Functions

The product allows developers to connect external power supply, E1 Emulator, and sensors by wiring from extended terminals on the board. Take the board out of the case for wiring modification. Note that wiring modification shall be performed on the responsibility of customers.

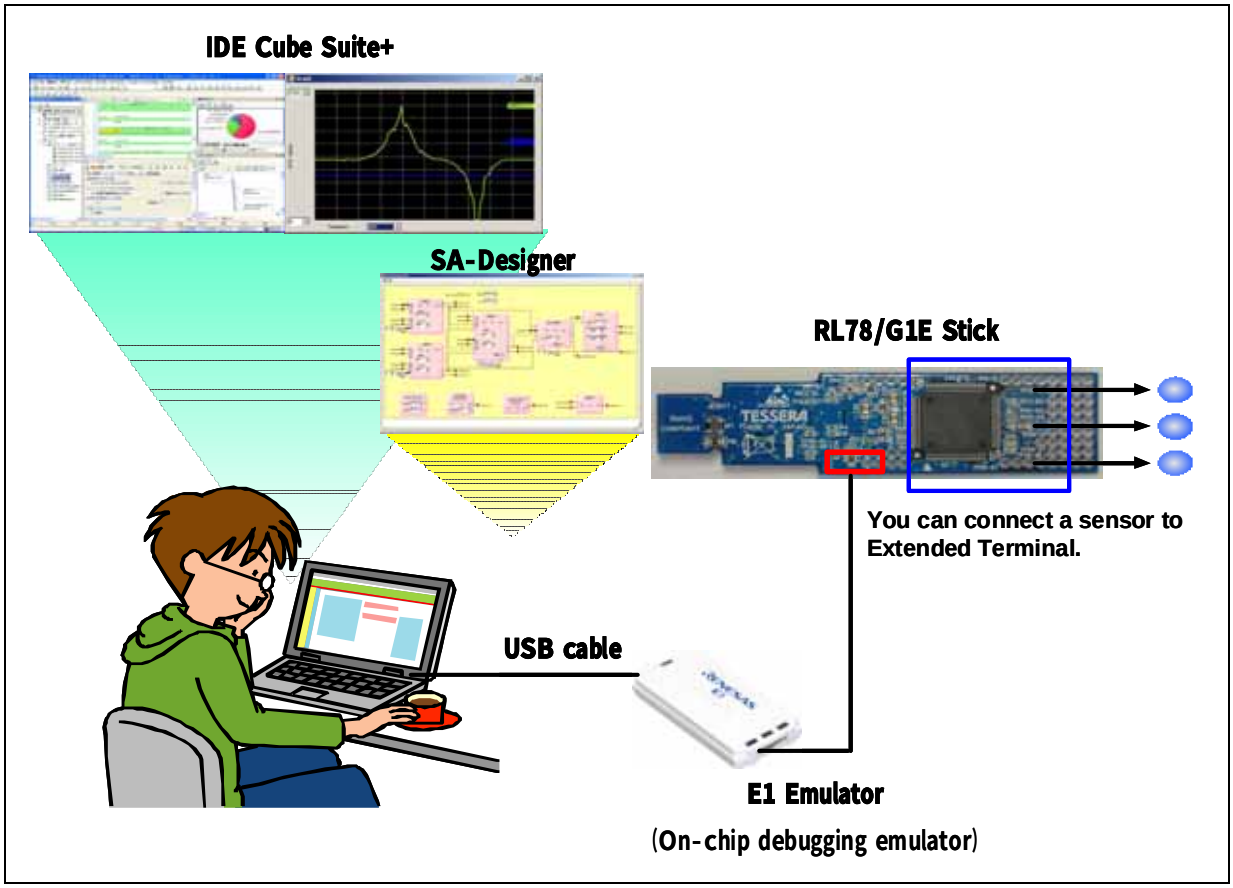


Figure 3.1 Connection Diagram for E1 Emulator

By connecting E1 Emulator to RL78/G1E Stick board, you can utilize the integrated development environment, CubeSuite+ and SA-Designer. For details, please refer to the manuals for CubeSuite+ and SA-Designer.

3.1 Connect External Power Supply

This section explains how to connect to external power supply. Wire from the external power supply connect terminals shown in Figure 3.2. For description of external power supply connect terminals, please refer to the Table 3.1.

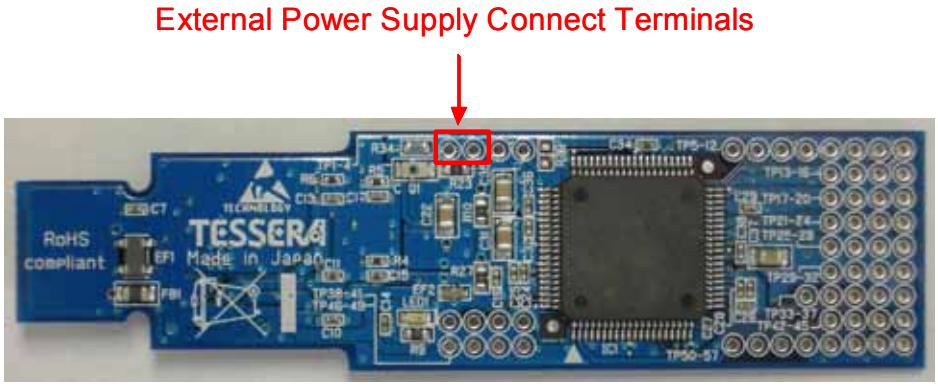


Figure 3.2 External Power Supply Connect Terminals

Table 3.1 External Power Supply Connect Terminal List

RL78/G1E Stick Board TP Number	External Power
TP1	GND *
TP2	+5V *

* Do not supply power from the external power connection terminal when it is connected to PC with USB cable. It receives power from PC as well and it may cause the board breakdown.

3.2 Connect E1 Emulator

This section explains how to connect to E1 Emulator. Wire from the E1 Emulator connect terminals shown in Figure 3.3. For E1 Emulator signals corresponding to connect terminals, please refer to the Table 3.2.

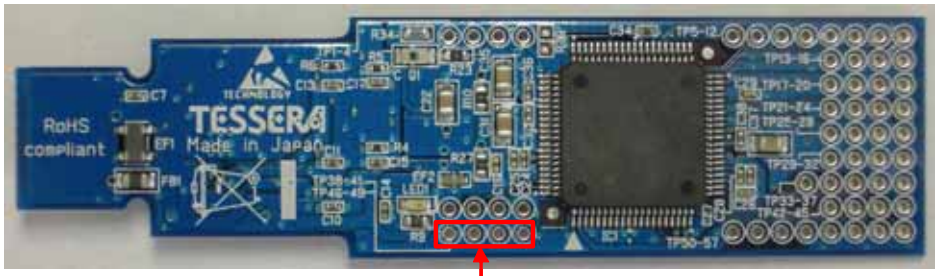


Figure 3.3 E1 Emulator Connect Terminals

Table 3.2 E1 Emulator Connect* Correspondence Table

RL78/G1E Stick Board TP Number	E1 Emulator Connector Pin Number	E1 Emulator Connector Terminal Name
TP46	2 12 14	GND
TP47	8 9	V_{DD} EMV_{DD}
TP48	10	RESET_OUT
TP49	5	TOOL0

* Note that you cannot connect to E1 Emulator connector directly. For details about E1 Emulator, please refer to “E1 Emulator User’s Manual”.

3.3 Connect Sensor

This section explains how to connect to sensors. Choose signals from the extended terminals shown in Figure 3.4, and wire from them. For RL78/G1E analog pins and extended terminals, please refer to the Table 3.3.

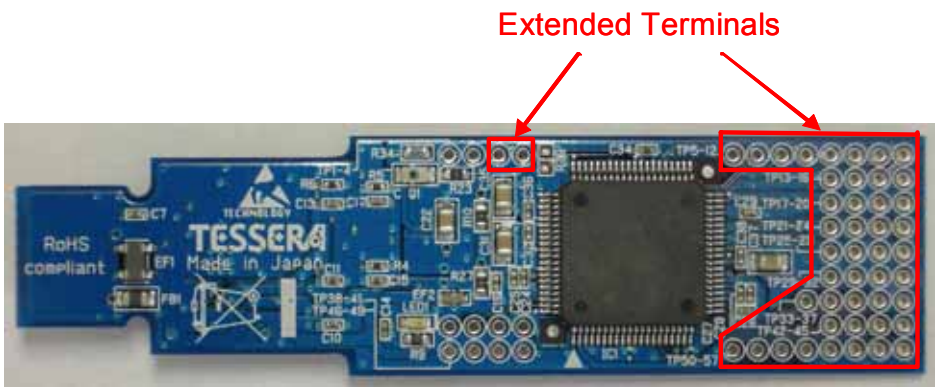


Figure 3.4 Extended Terminals

Table 3.3 Extended Terminal List

TP Number	Destination Signal Name	RL78/G1E Destination 1	RL78/G1E Destination 2	Other Internal Device Destination	TP Destination Function Description
TP1	External Power -	-	-	-	External power connect terminal - *1
TP2	External Power +	-	-	-	External power connect terminal + *1
TP3	MPXIN20	IC1-61	-	Phototransistor EMITTER terminal	Multiplexer 2 Input terminal 0 *2
TP4	MPXIN40	IC1-54	-	-	Multiplexer 4 Input terminal 0 (sensor connect terminal)
TP5	AMP1OUT	IC1-48	IC1-8	-	Configurable amp Ch1 output terminal
TP6	AMP2OUT	IC1-46	IC1-7	-	Configurable amp Ch2 output terminal
TP7	DAC3OUT	IC1-45	-	-	D/A Convertor Ch3 output terminal / Configurable amp Ch3 reference voltage input terminal
TP8	AMP3OUT	IC1-44	IC1-6	-	Configurable amp Ch3 output terminal
TP9	A_GND	-	-	-	Analog GND
TP10	AVDD1	-	-	-	Configurable amp Power terminal for Ch1-Ch3
TP11	MPXIN51	IC1-41	-	-	Multiplexer 5 Input terminal 1 (sensor connect terminal)
TP12	MPXIN60	IC1-42	-	-	Multiplexer 6 Input terminal 0 (sensor connect terminal)

(The table continues to the next page)

TP Number	Destination Signal Name	RL78/G1E Destination 1	RL78/G1E Destination 2	Other Internal Device Destination	TP Destination Function Description
TP13	MPXIN61	IC1-40	-	-	Multiplexer 6 Input terminal 1 (sensor connect terminal)
TP14	MPXIN50	IC1-43	-	-	Multiplexer 5 Input terminal 0 (sensor connect terminal)
TP15	DAC2OUT	IC1-50	-	-	D/A Convertor Ch2 output terminal / Configurable amp Ch2 reference voltage input terminal
TP16	DAC1OUT	IC1-51	-	-	D/A Convertor Ch1 output terminal / Configurable amp Ch1 reference voltage input terminal
TP17	GAMPOUT	IC1-38	IC1-11	-	Gain adjusting amp output terminal
TP18	GAMPIN	IC1-39	-	-	Gain adjusting amp input terminal
TP19	MPXIN41	IC1-52	-	-	Multiplexer 4 Input terminal 1 (sensor connect terminal)
TP20	MPXIN31	IC1-53	-	-	Multiplexer 3 Input terminal 1 (sensor connect terminal)
TP21	MPXIN30	IC1-55	-	-	Multiplexer 3 Input terminal 0 (sensor connect terminal)
TP22	MPXIN21	IC1-56	-	-	Multiplexer 2 Input terminal 1 (sensor connect terminal)
TP23	MPXIN11	IC1-57	-	-	Multiplexer 1 Input terminal 1 (sensor connect terminal)
TP24	DAC4OUT	IC1-36	-	-	D/A Convertor Ch4 output terminal / Gain adjusting amp, filter reference voltage input terminal
TP25	CLKLPF	IC1-32	IC1-16	-	Low-pass filter control clock input terminal
TP26	CLKSYNCH	IC1-33	IC1-17	-	Synchronous detection control clock input terminal
TP27	MPXIN10	IC1-62	-	-	Multiplexer 1 Input terminal 0 (sensor connect terminal)
TP28	SYNCHOUT	IC1-35	-	-	Synchronous detection output terminal
TP29	P71	IC1-68	-	-	Port 71
TP30	P72	IC1-69	-	-	Port 72
TP31	P70	IC1-67	-	-	Port 70
TP32	BGROUT	IC1-64	-	-	reference voltage generation circuit output terminal
TP33	CLKHPF	IC1-30	IC1-13	-	High-pass filter control clock input terminal
TP34	P73	IC1-70	-	-	Port 73
TP35	TEMPOUT	IC1-71	IC1-12	-	Temperature sensor output terminal
TP36	P121	IC1-22	-	-	Port 121
TP37	SCIN	IC1-31	-	-	Filter signal process input terminal

(The table continues to the next page)

TP Number	Destination Signal Name	RL78/G1E Destination 1	RL78/G1E Destination 2	Other Internal Device Destination	TP Destination Function Description
TP38	SA_USB_SSB	IC1-78	-	IC3-9	Port 13 USB controller I/F (chip selecting signal output)
TP39	SA_USB_MOSI	IC1-79	-	IC3-11	CSI00 serial data output USB controller I/F (serial data output)
TP40	SA_USB_MISO	IC1-80	-	IC3-10	CSI00 serial data input USB controller I/F (serial data input)
TP41	SA_USB_SCK	IC1-1	-	IC3-8	CSI00 clock input/output USB controller I/F (serial clock output)
TP42	HPFOUT	IC1-28	IC1-4	-	High-pass filter output terminal
TP43	P14	IC1-77	-	-	Port 14
TP44	P15	IC1-76	-	-	Port 15
TP45	P122	IC1-21	-	-	Port 122
TP46	D_GND	-	-	-	Digital GND (E1 Emulator connect terminal)
TP47	DVDD	-	-	-	Digital power (E1 Emulator connect terminal)
TP48	RESETB	IC1-19	-	-	External reset input (E1 Emulator connect terminal)
TP49	TOOL0	IC1-18	-	-	Flash memory programmer Debugger data input/output (E1 Emulator connect terminal)
TP50	AVDD	-	-	-	Analog power
TP51	D_GND	-	-	-	Digital GND
TP52	DVDD	-	-	-	Digital power
TP53	LPFOUT	IC1-27	IC1-5	-	Low-pass filter output terminal
TP54	GPX	-	-	IC3-12	USB controller general purpose multiplexer output terminal
TP55	P00	IC1-14	-	-	Port 00
TP56	P140	IC1-15	-	-	Port 140
TP57	P137	IC1-20	-	-	Port 137

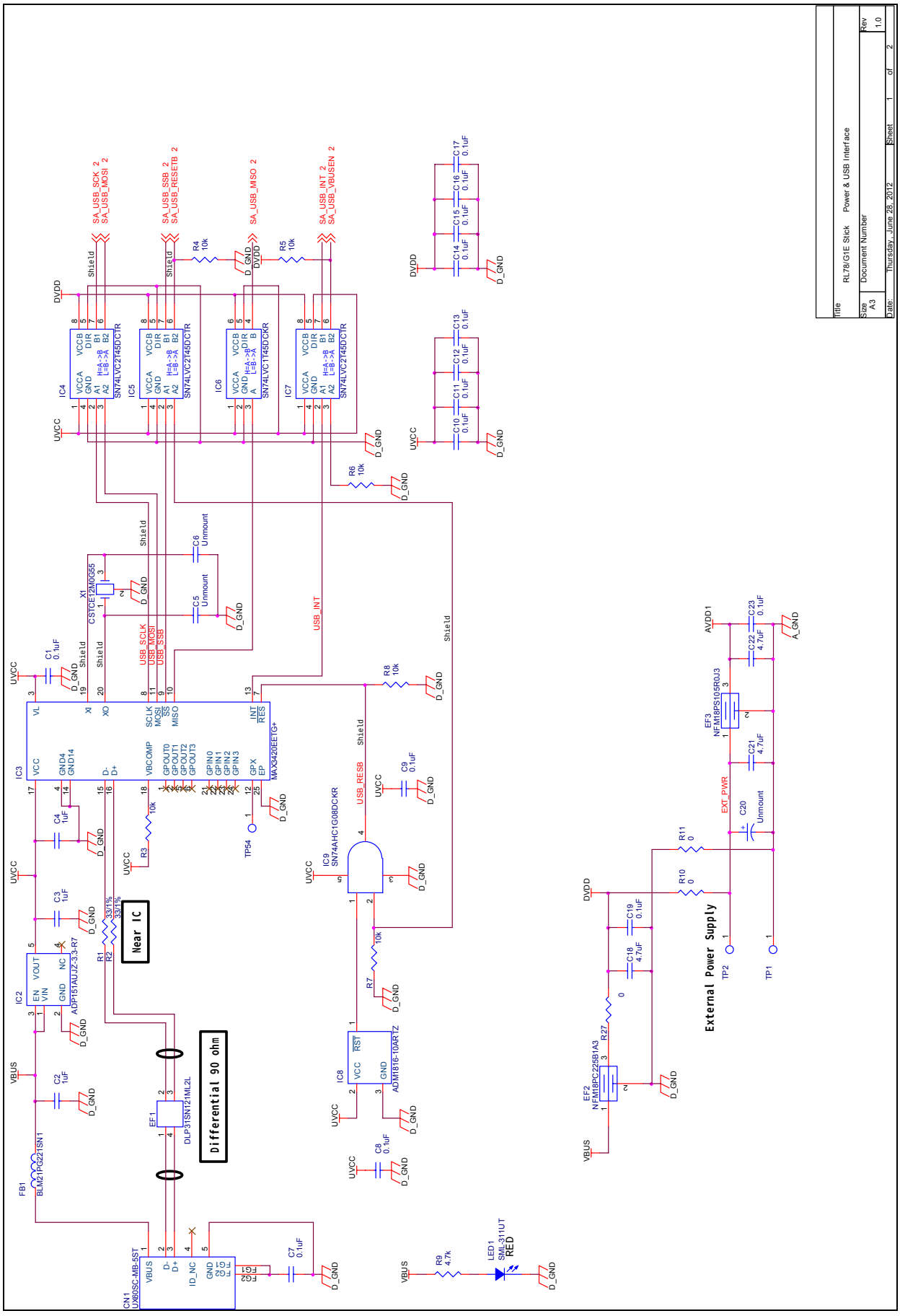
*1 Do not supply power from the external power connection terminal when it is connected to PC with USB cable. It receives power from PC as well and it may cause the board breakdown.

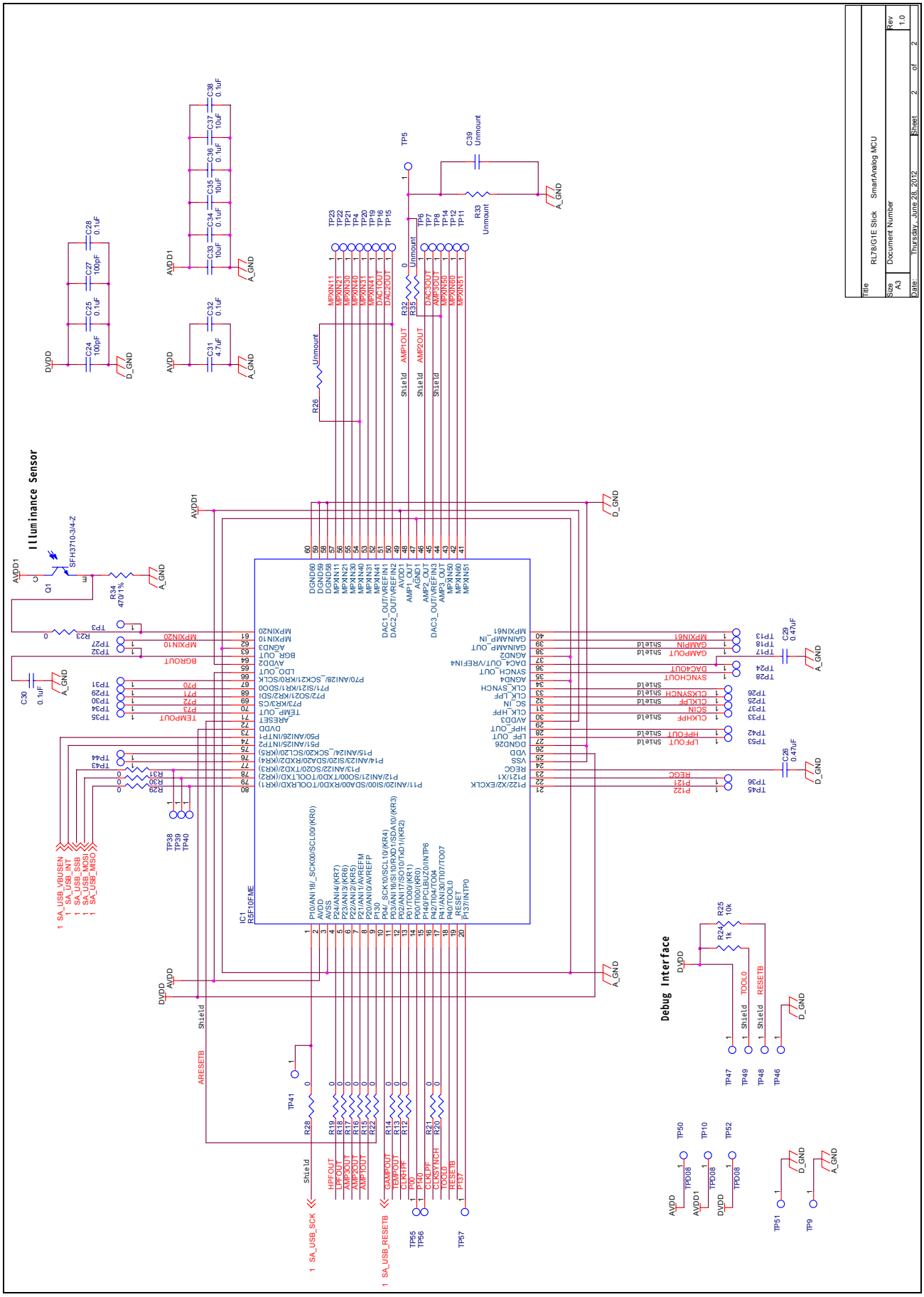
*2 This is a sensor connect terminal, but it is connected to phototransistor

4. Hardware Materials

4.1 Circuit Diagrams

The circuit diagrams are described in the following pages.


Near IC
Differential 90 ohm
External Power Supply
Title
RL78/G1E Stick Power & USB Interface
Size
A3
Document Number
Rev
1.0
Date:
Thursday, June 28, 2012
Sheet
1
of
2


Illuminance Sensor
Debug Interface
IC1
R5F10FME
SFH3710-3/4-Z
Title
RL78/G1E Stick SmartAnalog MCU
Size A3
Document Number
Rev 1.0
Date: Thursday, June 28, 2012
Sheet 2 of 2

4.2 Parts List

The parts information is listed in the following page.

RL78/G1E Stick Parts List Version 1.0

Item	Quantity	Reference(Mount Parts)	Reference(Unmount Parts)	Part Name	Part Kind	Part Model Number	Maker	Memo
1	1	CN1		UX60SC-MB-5ST	Connector	UX60SC-MB-5ST	HIROSE ELECTRIC	
2	21	C1,C7,C8,C9,C10,C11,C12,		0.1uF	Ceramic Capacitor	1005(0402)Size/0.1uF/25V/F Class	-	
		C13,C14,C15,C16,C17,C19,						
		C23,C25,C28,C30,C32,C34,						
		C36,C38						
3	3	C2,C3,C4		1uF	Ceramic Capacitor	1608(0603)Size/1uF/16V/B Class	-	
4	3		C5,C6,C39	Unmount	Ceramic Capacitor	1005(0402)Size	-	
5	4	C18,C21,C22,C31		4.7uF	Ceramic Capacitor	2012(0805)Size/4.7uF/16V/B Class	-	
6	1		C20	Unmount	Tantalum electrolytic capacitor	3528Size	-	
7	2	C24,C27		100pF	Ceramic Capacitor	1005(0402)Size/100pF/16V/CH Class	-	
8	2	C26,C29		0.47uF	Ceramic Capacitor	1005(0402)Size/0.47uF/10V/B Class	-	
9	3	C33,C35,C37		10uF	Ceramic Capacitor	2012(0805)Size/10uF/16V/B Class	-	
10	1	EF1		DLP31SN121ML2L	Common Mode Choke Coil	DLP31SN121ML2L	Murata Manufacturing	
11	1	EF2		NFM18PC225B1A3	EMIFIL	NFM18PC225B1A3	Murata Manufacturing	
12	1	EF3		NFM18PS105R0J3	EMIFIL	NFM18PS105R0J3	Murata Manufacturing	
13	1	FB1		BLM21PG221SN1	Chip Ferrite Bead	BLM21PG221SN1	Murata Manufacturing	
14	1	IC1		R5F10FME	MCU	R5F10FMEAFB	Renesas Electronics	
15	1	IC2		ADP151AUJZ-3.3-R7	Linear Regulator	ADP151AUJZ-3.3-R7	Analog Devices	
16	1	IC3		MAX3420EETG+	USB Peripheral Controller	MAX3420EETG+	Maxim Integrated Products	
17	3	IC4,IC5,IC7		SN74LVC2T45DCTR	BUS Transceiver	SN74LVC2T45DCTR	Texas Instruments	
18	1	IC6		SN74LVC1T45DCKR	BUS Transceiver	SN74LVC1T45DCKR	Texas Instruments	
19	1	IC8		ADM1816-10ARTZ	Microprocessor Reset Circuit	ADM1816-10ARTZ	Analog Devices	
20	1	IC9		SN74AHC1G08DCKR	AND Gate	SN74AHC1G08DCKR	Texas Instruments	
21	1	LED1		SML-311UT	LED	SML-311UT	ROHM Semiconductor	
22	1	Q1		SFH3710-3/4-Z	Phototransistor	SFH3710-3/4-Z	OSRAM AG	
23	2	R1,R2		33/1%	Register	1005(0402)Size/33ohm/0.063W/±1%	-	
24	7	R3,R4,R5,R6,R7,R8,R25		10k	Register	1005(0402)Size/10Kohm/0.063W/±5%	-	
25	1	R9		4.7k	Register	1608(0603)Size/4.7Kohm/0.1W/±5%	-	
26	9	R10,R11,R23,R27,R28,R29,		0	Register	1608(0603)Size/0ohm	-	
		R30,R31,R32						
27	11	R12,R13,R14,R15,R16,R17,		0	Register	1005(0402)Size/0ohm	-	
		R18,R19,R20,R21,R22						
28	1	R24		1k	Register	1005(0402)Size/1Kohm/0.063W/±5%	-	
29	2		R26,R35	Unmount	Register	1608(0603)Size	-	
30	1		R33	Unmount	Register	1005(0402)Size	-	
31	1	R34		470/1%	Register	1608(0603)Size/470ohm/0.1W/±1%	-	
32	57		TP1,TP2,TP3,TP4,TP5,TP6,	TPD08	Test Point	φ0.8mm Through Hole	-	
			TP7,TP8,TP9,TP10,TP11,					
			TP12,TP13,TP14,TP15,TP16,					
			TP17,TP18,TP19,TP20,TP21,					
			TP22,TP23,TP24,TP25,TP26,					
			TP27,TP28,TP29,TP30,TP31,					
			TP32,TP33,TP34,TP35,TP36,					
			TP37,TP38,TP39,TP40,TP41,					
			TP42,TP43,TP44,TP45,TP46,					
			TP47,TP48,TP49,TP50,TP51,					
			TP52,TP53,TP54,TP55,TP56,					
			TP57					
33	1	X1		CSTCE12M0G55	Oscillator	CSTCE12M0G55	Murata Manufacturing	12MHz

4.3 Board Size

Figure 4.1 shows the board size and the position of connectors. The through-holes for extended terminals and E1 Emulator connect terminals are placed with 2mm pitch.

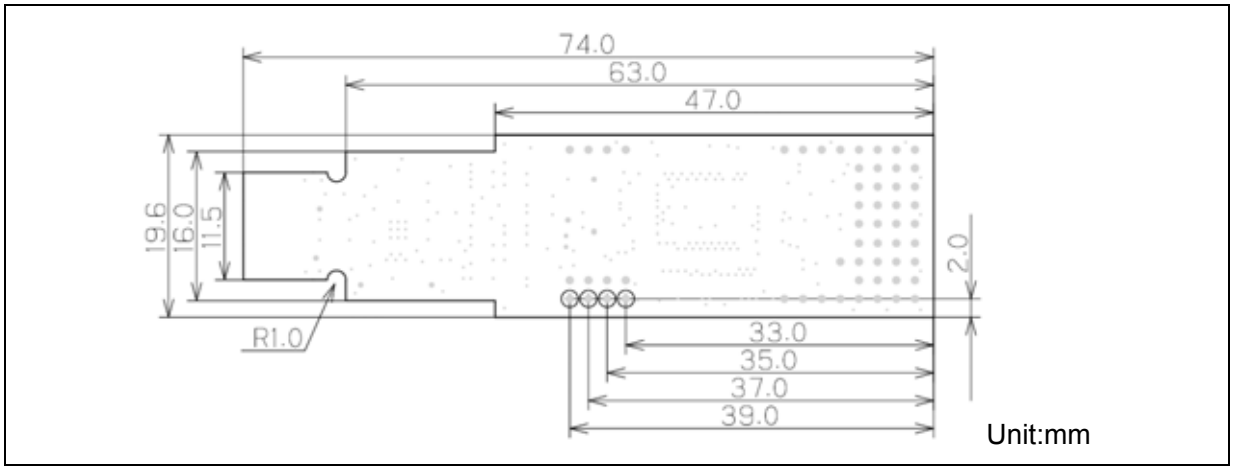


Figure 4.1 Board Size

4.4 Parts Layout

Figure 4.2 shows the parts layout on the front side of the board, and Figure 4.3 shows the parts layout on the back site.

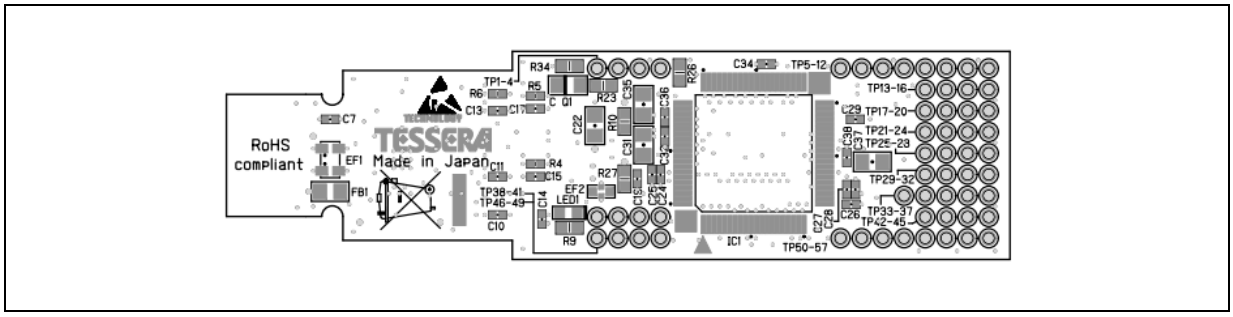


Figure 4.2 Parts Layout (front side)

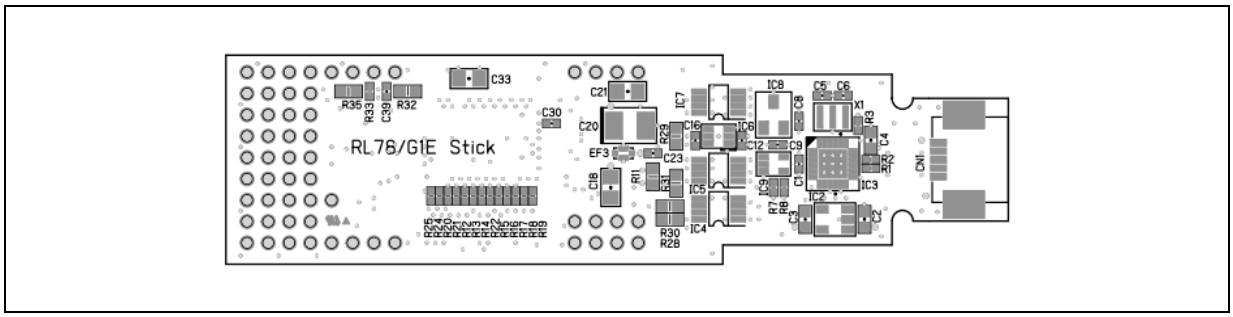


Figure 4.3 Parts Layout (back side)